FINDING VALUE IN SUSTAINABLE AND RESPONSIBLE INVESTMENTS

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Abstract

This paper assesses the characteristics and financial performance of a comprehensive set of passive sustainable and responsible investments (SRI) around the world. We contribute the novel finding that from a financial perspective, SRI portfolios pursue first and foremost a pure value strategy when using an undistorted value measure. This result holds irrespective of the index provider, the screening, and the weighting approach. It is also robust across international markets and to various asset pricing anomalies such as size, momentum, short-term reversal, betting-against-beta, and quality-minus-junk. We corroborate that SRI's financial performance is neutral with slight indications that score-weighting or a combined approach using positive and negative environmental, social and governance (ESG) screens fare better.

Keywords: Sustainable and Responsible Investments, Performance Attribution, Performance Evaluation

Authors' individual contribution: Conceptualization — S.L.; Methodology — S.L.; Formal Analysis — G.H.; Writing — Original Draft — S.L.; Writing — Review & Editing — S.L.; Visualization — S.L. and G.H.; Supervision — S.L.; Project Administration — S.L.

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1. INTRODUCTION

Over the last years, sustainable and responsible investments (SRI) experienced impressive development. According to the U.S. Sustainable Investment Forum (US SIF Foundation, 2022), SRI accounts for more than 12 percent of U.S. assets under professional management with more than $66 trillion dollars. The growing demand is mainly driven by institutional and retail investors from all over the world (Eurosif, 2018; Boersch, 2010).

The remaining structure of this paper is as follows. The next section reviews the literature. Section 3 presents the research framework. There we describe our data on sustainable and responsible indices. We then lay out the research methodology for attributing and evaluating financial performance at the international level. In Section 4, we explain our research results while also testing their robustness. Section 5 discusses our results and Section 6 concludes the paper.

2. LITERATURE REVIEW

Parallel to this trend, a large body of SRI literature has emerged over the years in finance academia. Moskowitz (1972) is often referred to as the starting point of modern SRI research. Numerous papers address SRI from different perspectives such as the cost of capital, firm value, investor profiling, or portfolio optimization. Theory suggests that investors seek to optimize their portfolios along the dimensions of financial return and risk while integrating environmental, social and governance (ESG) considerations. Pedersen et al. (2021) derive such an ESG-efficient frontier and show how to apply their model empirically. Pástor et al. (2021) build an equilibrium model in which the ESG factor and the market portfolio price assets in a two-factor model.

A great number of empirical studies measure the financial performance of SRI. We start with that stream of the empirical literature reviewing SRI mutual funds. Luther et al. (1992) cannot detect a significant outperformance of SRI funds over a broad market index for the UK. Luther and Matatko (1994) demonstrate that the results are also valid using a small company index. Hamilton et al. (1993) compare SRI and conventional mutual funds from the U.S. market. Their findings do not indicate performance effects by including sustainable and responsible investment criteria. Later studies,

namely Mallin et al. (1995), Gregory et al. (1997), Statman (2000), Schröder (2004), Bauer et al. (2005), Kreander et al. (2005), Scholtens (2005), Gregory and Whittaker (2007), and Cortez et al. (2009) confirm a neutral performance of SRI funds for international markets including Europe, the Netherlands, the UK, and the U.S. Nevertheless, an SRI constraint can lead to significant costs for mutual fund investors considering different pricing models (Geczy et al., 2021; Chang & Witte, 2010).

Intentional impact investors of dual-objective venture capital funds are willing to forego a significant percentage of financial returns as Barber et al. (2021) document financial underperformance.

Instead of looking at actively managed portfolios, a number of empirical studies compare the performance of passively managed portfolios, i.e., SRI indices with market indices. As opposed to mutual funds, indices are free of transaction costs and management fees and do not depend on the ability of fund managers. Sauer (1997), Statman (2000), Schröder (2004), Statman (2006), Schröder (2007), as well as Lobe and Walkshäusl (2016), suggest a neutral performance of SRI indices relative to their conventional benchmarks.

Contrasting the findings for SRI's active and passive portfolios, SRI rankings or specific ESG segments can help to achieve financial outperformance by selecting highly ranked companies. Fischer and Khoury (2007) show that such a strategy works in the Canadian market, while Kempf and Osthoff (2007) document this for the U.S. market. Edmans (2011) establishes that building a portfolio based on the "100 Best Companies to Work For in America" delivers a statistically significant financial outperformance. Again, the governance (G) segment leads to superior financial returns, while environmental (E) and sin as a measure of social (S) segments do not appear as strong leaving the overall ESG portfolio with a neutral performance as Pedersen et al. (2021) report. Their U.S. findings on E and S are also consistent with research on international markets by Lesser et al. (2014) and Lobe and Walkshäusl (2016).

The value characteristic is often measured with book-to-price as a proxy. However, it is the long time lag of up to 18 months that potentially contaminates the Fama and French (1993) value measure with momentum. Twenty years later, Asness and Frazzini (2013) noted this issue and proposed a solution by refining the value metric.

Research based on the popular Fama and French (1993) value definition concludes that sustainable and responsible investments in international markets are more tilted toward growth than to value as set forth by Renneboog et al. (2008) and Lobe and Walkshäusl (2016).

Our research question addresses this gap in the literature:

RQ: Are SRI portfolios still tilted towards growth when using an undistorted value measure?

Our paper contributes to the literature using the modified "pure" value measure by Asness and Frazzini (2013) which is purged from momentum effects while analyzing investment portfolios which allow a more undistorted look at SRI. Both issues matter and are fundamental to our understanding of SRI's performance attribution. As a consequence, we focus on indices providing a passive investment strategy. Compared to mutual funds, indices are not subject to the effects of active management and transaction costs. We establish that sustainable and responsible investments indeed pursue first and foremost a value strategy while controlling for systematic risk (beta) and other well-known capital market anomalies. We find that this result is irrespective of the choice of the index provider, the screening and weighting approach applied to an SRI portfolio. Furthermore, the value strategy is also present across international markets.

3. RESEARCH FRAMEWORK

In this section, we outline the construction of the data set and explain the econometric framework for the following performance attribution analysis.

SRI "is a long-term oriented investment approach which integrates ESG factors in the research, analysis, and selection process of securities within an investment portfolio" (Eurosif, 2018, p. 12).

With the objective in mind to receive the most comprehensive data universe, we set out to collect all available equity indices targeting SRI at the global, regional, and country levels. We focus on portfolios including the full ESG spectrum while excluding indices that emphasize a singular segment as environmental aspects (e.g., green investing) or religious screens (e.g., Islamic investing). We identify 150 distinct indices issued by more than 30 different providers from various data sources like Thomson Financial Datastream, Bloomberg, or directly from index providers. Avoiding a survivorship bias, we also include dead indices (Brown et al., 1992). We are able to retrieve financial data for 129 indices. All total returns (that is, including dividends) are denominated in U.S. dollars and are measured at monthly intervals (Agrrawal & Clark, 2007).

We exclude nine indices having a data history of less than 24 months and 20 indices covering markets for which we are not able to obtain suitable factor returns. Hence, the final data set contains 100 SRI indices. Table 1 informs about the characteristics of the sample, reporting the number of SRI indices sorted by index provider, screening and weighting approach.

Table 1. Characteristics of SRI indices

Panel A: Provider						
MSCI	*DJ*	*FTSE*	*STOXX*	*ECPI*	*ESI*	*Other*
40	16	10	8	8	4	14

Panel B: Screening approach	
Combined	*Positive*
53	47

Panel C: Weighting approach		
Value-weighted	*Score-weighted*	*Equal-weighted*
68	26	6

Note: This table reports the sample distribution of all 100 SRI indices by provider, screening approach, and weighting approach. The combined screening approach integrates positive and negative ESG screens. Score-weighted portfolios use ESG criteria rankings to attribute weights to the stock constituents of their SRI portfolios.

Panel A includes17 distinct providers, the biggest of which, in terms of the number of branded indices, are Morgan Stanley Capital International (MSCI) with 40 indices, Dow Jones & Company (DJ) with

16 indices, Financial Times Stock Exchange Group (FTSE) with 10 indices, STOXX Limited and ECPI Group, both with eight indices, Forum Ethibel (ESI) with four indices, and 11 other providers representing the remaining 14 indices.

SRI index providers employ different strategies like positive screening and negative screening that define which companies are admissible for their portfolios or a combination of both. Negative screening excludes controversial business sectors such as gambling, tobacco, alcohol, etc. Positive screening commonly evaluates a company's corporate social performance based on ESG aspects. None of the SRI indices in our sample applies exclusively to negative screens. Panel B documents that 47 indices employ a positive selection approach, while 53 combine both practices.

Another important dimension next to the screening approach is the way the selected companies are weighted. Value weighting appeals theoretically to the market portfolio which by definition is invested in all assets according to their market weights based on the notion of the capital asset pricing model (CAPM). However, since SRI portfolios have a limited number of constituents, value weighting facilitates an implementation due to its investability and higher liquidity of the relative portions attached to the selected SRI stocks. An argument for equal weighting is that it performs better than value weighting as shown by DeMiguel et al. (2009). Kirby and Ostdiek (2012) argue that this procedure is conservative and that optimizing approaches perform even better than this rather naive approach. Looking at score-weighted portfolios seems to be especially a promising alternative for sustainable and responsible investments as put forward by Edmans (2011) and others. In our sample, 68 indices are value-weighted, 26 score-weighted, and only six equal-weighted, as shown in Panel C.

The portfolios in our sample span different investment areas. Around two-thirds are at the global and regional level, while one-third is at the country level. Figure 1 presents the geographic allocation of the SRI sample indices. Our sample covers mainly developed markets according to the MSCI classification with the exception of the SRI index from Israel, and the Tel Aviv Stock Exchange Maala SRI.

Figure 1. Proportion of SRI indices by geographical focus

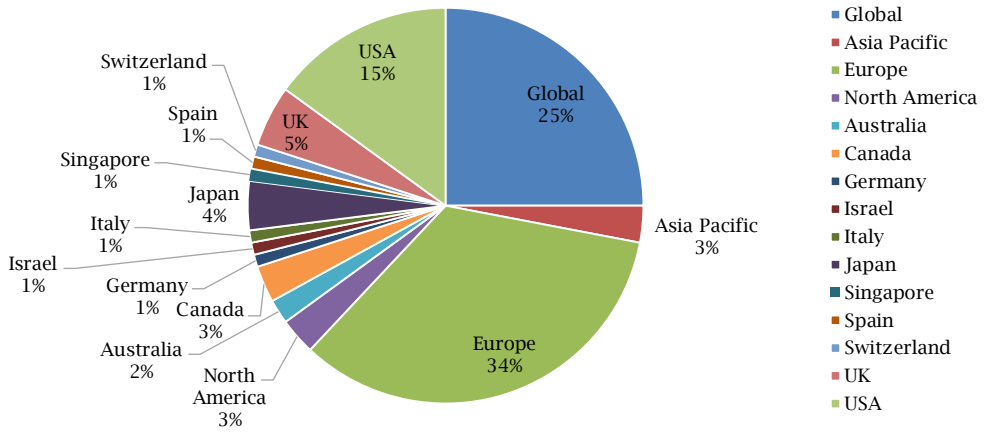
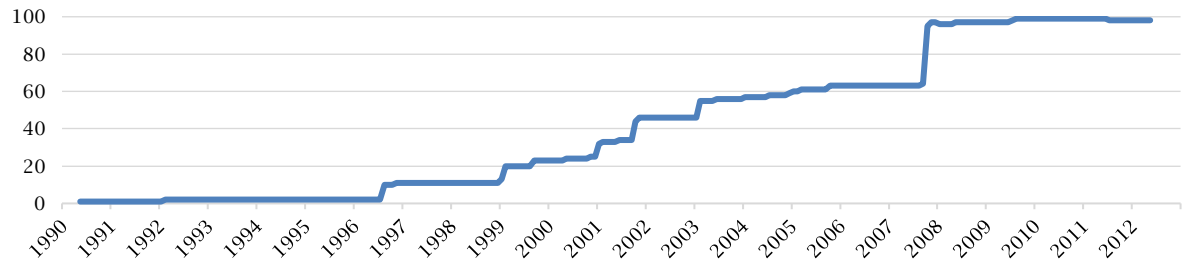


Figure 2 highlights the sample's evolution of SRI indices over time. The MSCI KLD 400 Social is the first SRI index launched in 1990 covering the U.S. market. As of next, Vigeo entered this market segment with the ASPI Eurozone Index in 1992. The development of available indices is slowly increasing and occurs in waves. In 2007, MSCI significantly extended this market segment by entering and issuing a variety of different SRI indices. At the end of May 2012, 98 indices were present, while two indices became inactive. All in all, our SRI sample has a time series of 265 months yielding 10,857 index-month observations.

Figure 2. Number of SRI indices



Note: This figure tracks the market evolution of the sample's 100 SRI indices.

In our base model, we use time-series regressions with three different asset pricing models for analyzing financial performance and investment characteristics. We apply the CAPM by Treynor (1961, 1962), Sharpe (1964), Lintner (1965), and Mossin (1966) explaining a stock's return by the market return as a systematic risk factor as shown in Eq. (1). Jensen's (1968) alpha provides a measure for an outperformance left unexplained by the model. In the next step, we utilize the Fama and French (1993) three-factor model in Eq. (2). This model accounts for empirical contradictions (anomalies) of the CAPM with regard to a size and value anomaly as set forth by Banz (1981) and Fama and French (1992). Jegadeesh and Titman (1993) further identify a momentum anomaly. Hence, we also consider the Carhart (1997) four-factor model in Eq. (3). We estimate the models using the following regressions:

$$r_{i,t} - r_{f,t} = a_{CAPM,i} + b_i\left(r_{m,t} - r_{f,t}\right) + u_{i,t} \quad (1)$$

$$r_{i,t} - r_{f,t} = a_{FF,i} + b_i\left(r_{m,t} - r_{f,t}\right) + s_i SMB_t + h_i HML_t + u_{i,t} \quad (2)$$

$$r_{i,t} - r_{f,t} = a_{FFC,i} + b_i\left(r_{m,t} - r_{f,t}\right) + s_i SMB_t + h_i HML_t + w_i WML_t + u_{i,t} \quad (3)$$

where, Eq. (1) is the single-factor CAPM; Eq. (2) is the Fama and French (1993) three-factor model (FF); Eq. (3) is the Carhart (1997) four-factor model (FFC); $r_{i,t} - r_{f,t}$ denotes the excess return of SRI index *i* over the one-month U.S. Treasury Bill rate in month *t*; $r_{m,t} - r_{f,t}$ is the market excess return, while *SMB*, *HML*, and *WML* represent premia related to size, book-to-market, and momentum; $a_{Model,i}$ is the average monthly alpha expressing the return left unexplained by the three asset pricing models *CAPM, FF,* and *FFC*, respectively. Finally, $u_{i,t}$ is the regression residual. Accounting for time-series correlation and heteroskedasticity of regressions residuals, we estimate standard errors for the regression coefficients using the Newey and West (1987) procedure. Since the alphas are determined on a monthly basis, they are annualized for the purpose of an easier interpretation.

An issue with the measurement of *HML* is that the Fama and French (1992) approach uses information that is up to 18 months old to form portfolios based on book-to-price. This leads to a distorted value measure because the momentum anomaly measured at a monthly interval is not disentangled from this metric. Asness and Frazzini (2013) highlight this issue and propose a more timely measurement of the price component of *HML* at a monthly interval which is free of this concern. In other words, this innovatively construed *HML* measure tries to capture the "true" value strategy, not a mixed value-momentum strategy as in Fama and French (1992). For this very reason, the Asness and Frazzini (2013) approach suits our analysis the best. Table 2 reports these and other premia of 15 markets (global, regional, and country levels) relevant to our sample indices over the time period from May 1990 to May 2012. All explanatory factors stem from AQR's database.

Table 2. Summary statistics for explanatory returns

Geographical focus	*MKT*	*SMB*	*HML*	*WML*
Global	0.34	0.12	0.45	0.63
	(1.17)	(0.90)	(2.45)	(2.47)
Asia Pacific	0.10	0.05	0.94	0.32
	(0.29)	(0.29)	(5.28)	(1.21)
Europe	0.34	0.04	0.34	0.88
	(1.06)	(0.28)	(1.78)	(3.28)
North America	0.55	0.22	0.27	0.61
	(1.95)	(1.13)	(1.10)	(1.98)
Australia	0.77	0.29	0.41	1.33
	(2.06)	(1.47)	(1.92)	(4.91)
Canada	0.63	0.10	0.18	1.45
	(1.80)	(0.66)	(0.67)	(4.03)
Germany	0.19	-0.14	0.48	0.95
	(0.51)	(-0.75)	(1.83)	(2.76)
Israel	0.09	-0.01	0.20	0.86
	(0.14)	(-0.04)	(0.48)	(2.36)
Italy	0.08	-0.09	-0.05	0.63
	(0.18)	(-0.37)	(-0.17)	(1.94)
Japan	-0.11	0.07	1.05	0.15
	(-0.28)	(0.33)	(5.14)	(0.52)
Singapore	0.85	-0.21	0.69	0.19
	(1.82)	(-0.71)	(2.29)	(0.53)
Spain	0.46	-0.15	0.16	0.59
	(1.13)	(-0.74)	(0.59)	(1.93)
Switzerland	0.67	0.02	0.26	0.70
	(2.07)	(0.10)	(1.14)	(2.25)
United Kingdom	0.44	0.11	0.42	0.96
	(1.45)	(0.53)	(1.81)	(3.25)
United States	0.54	0.22	0.27	0.57
	(1.95)	(1.08)	(1.07)	(1.83)

Note: This table presents average monthly premia for the market (MKT), size (SMB), undistorted Asness and Frazzini (2013) value (HML), and momentum (WML) factors in each market over the sample period. We employ zero-investment, factor-mimicking portfolios construed by Asness and Frazzini (2013). T-statistics are in parentheses.

The value premium and the momentum premium are both positive (except *HML* for Italy) and statistically significant at the five percent level in four and eight out of 15 international markets, while the market risk premium (positive except for Japan) and the size premium (mixed signs) are weak with only two and none being statistically significant. It is reaffirming that Walkshäusl and Lobe (2014) document similar premia for *MKT, SMB,* and the traditional *HML* between 1982 and 2009. Furthermore, Chui et al. (2010) report between 1984 and 2003 *WML* results similar to those in column 5 of Table 2. Fama and French (2012) provide evidence that capital markets are not fully integrated suggesting that explanatory factors deliver at least a passable story at the regional level. For the performance evaluation and performance attribution we employ geographically matched market benchmarks and premia at the global, regional, and country levels with the caveat in mind that the power at the country level can be diminished, especially when there is a small number of indices and the market is relatively small.

4. RESEARCH RESULTS

Table A.1 (see the Appendix) reports the annualized alpha coefficients of all three model specifications and the anomaly coefficients of the four-factor model along with the adjusted R^2. Panel A aggregates the results of all 100 SRI indices. Results are reported individually in Panel B along with the name of the SRI index and the start month followed by the month when the index ceases to exist before the end of the investigation period in May 2012. For an efficient representation, Panel A displays mean regression coefficients and mean R^2s, while the percentages below indicate which fraction of SRI indices exhibits a positive (negative) statistically significant coefficient at the five percent level. The reason why we do not compute t-statistics on a portfolio of indices is simply to avoid over-diversification. Moving away from a conservative investment strategy, Brown et al. (2012) show that even funds of hedge funds, which certainly differ from closet index funds, are plagued by over-diversification.

We start with the discussion of the FFC model performance attribution results of the full sample of SRI indices. The FF model results are, of course, very similar with respect to beta, size, and the Asness and Frazzini (2013) value measure. Hence, we can skip details.

The most striking result is that almost half of the SRI indices are tilted towards value exhibiting a positive loading (*h*) with more than two standard errors away from zero while only seven exhibit a significant growth tilt. The undistorted value measure delivers the novel finding that sustainable and responsible investments pursue first and foremost a value strategy.

Beta (*b*) averaged over all indices amounts to 0.97. Loadings on size (*s*) indicate a big firm tilt having an average *s* of -0.09 with 44 negative, but eight positive loadings statistically significant at the five percent level. It is reassuring that seven of the eight indices, which show a significant small-cap tilt, are indeed labeled small-cap indices. Momentum results are not as pronounced as the other styles. Seventeen SRI indices offer a significantly positive momentum (*w*) tilt, and seven a significantly negative momentum tilt. The relatively small number of significant momentum style detections is not very surprising since passive portfolios can hardly chase winners and losers by design as mutual funds can.

The four-factor model has an annualized alpha of -0.30% on average. Five (ten) out of 100 indices exhibit a positive (negative) and statistically significant alpha that is more than two standard errors away from zero. All specifications, i.e., Models 1–3, unequivocally say that SRI indices do not generally offer a systematic performance difference compared to their benchmarks. Hence, we can infer that SRI delivers a neutral performance in light of the CAPM, the FF three-factor model, and the FFC four-factor model results.

As we find that sustainable and responsible investments pursue a value strategy based on the undistorted value measure, we test whether this holds when we look at various subsamples. We specifically analyze subsamples by sorting on different providers, screening approaches, weighting schemes, and international markets.

Table 3. Performance and attribution measurement of SRI indices by provider

Index provider	a_{CAPM}	a_{FF}	a_{FFC}	*b*	*s*	*h*	*w*	R^2
MSCI	1.74	1.27	0.95	0.95	-0.01	0.17	0.06	0.94
	15.00 (2.50)	12.50 (0.00)	10.00 (0.00)	100.00 (0.00)	7.50 (2.50)	47.50 (2.50)	25.00 (2.50)	
DJ	-1.29	-0.96	-1.54	1.01	-0.24	0.23	0.05	0.95
	0.00 (18.75)	0.00 (6.25)	0.00 (12.50)	100.00 (0.00)	0.00 (93.75)	75.00 (12.50)	25.00 (12.50)	
FTSE	-0.41	-0.05	-0.09	0.98	-0.20	0.05	-0.02	0.93
	0.00 (10.00)	0.00 (0.00)	0.00 (10.00)	100.00 (0.00)	0.00 (80.00)	30.00 (10.00)	0.00 (10.00)	
ECPI	-2.29	-1.94	-2.37	0.99	-0.13	0.18	0.05	0.93
	0.00 (50.00)	0.00 (50.00)	0.00 (50.00)	100.00 (0.00)	12.50 (62.50)	50.00 (12.50)	25.00 (0.00)	
STOXX	-1.93	-1.50	-1.52	1.04	-0.30	0.18	0.00	0.94
	0.00 (12.50)	0.00 (0.00)	0.00 (0.00)	100.00 (0.00)	0.00 (100.00)	50.00 (0.00)	0.00 (0.00)	
ESI	-0.64	-0.25	-0.72	0.85	-0.22	0.26	0.05	0.87
	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	100.00 (0.00)	0.00 (75.00)	50.00 (0.00)	0.00 (0.00)	
Others	-1.05	-1.69	-0.61	0.95	0.10	0.02	-0.10	0.76
	7.14 (14.29)	0.00 (21.43)	7.14 (21.43)	92.86 (0.00)	28.57 (28.57)	21.43 (14.29)	7.14 (21.43)	

Note: This table presents annualized alphas for the regression variants applying three alternative asset pricing models to explain monthly excess returns of SRI indices sorted by provider. a_{CAPM} *denotes the CAPM alpha.* a_{FF} *is the alpha based on the three-factor model of Fama and French (1993), and* a_{FFC} *is the alpha based on the four-factor model of Fama and French (1993) augmented with the factor of Carhart (1997). For the four-factor model, b is the estimated coefficient of the market risk premium, while s, h, and w are the estimated coefficients of the mimicking portfolios for size (SMB), the undistorted Asness and Frazzini (2013) value (HML), and momentum (WML). We employ the premia construed by Asness and Frazzini (2013). The table reports mean regression coefficients and mean adjusted* R^2*s, while the percentages below indicate which fraction of SRI indices exhibit a positive (negative) statistically significant coefficient at the five percent level based on the Newey and West (1987) estimator.*

Table 3 reports that the pure value strategy is predominantly strong across all providers with positive *h* coefficients that are often statistically significant. We can conclude that the value tilt is not driven by a specific provider. However, FTSE and smaller index providers do not exhibit as many significant *h* coefficients as their peers. With respect to alpha, size, and momentum the variation across providers is more pronounced. Interestingly, MSCI delivers positive alphas while all other providers exhibit negative alphas, some with statistical significance for all three model specifications.

Table 4. Performance and attribution measurement of SRI indices by screening approach

	a_{CAPM}	a_{FF}	a_{FFC}	*b*	*s*	*h*	*w*	R^2
Combined	0.34	0.32	0.24	0.97	-0.12	0.15	0.02	0.91
	9.43 (11.32)	7.55 (7.55)	7.55 (9.43)	100.00 (0.00)	5.66 (49.06)	47.17 (5.66)	13.21 (7.55)	
Positive	-0.51	-0.73	-0.91	0.98	-0.06	0.15	0.02	0.91
	4.26 (12.77)	2.13 (8.51)	2.13 (10.64)	97.87 (0.00)	10.64 (38.3)	46.81 (8.51)	21.28 (6.38)	

Note: This table presents annualized alphas for the regression variants applying three alternative asset pricing models to explain monthly excess returns of SRI indices sorted by the screening approach. The combined screening approach integrates positive and negative ESG screens. a_{CAPM} denotes the CAPM alpha. a_{FF} is the alpha based on the three-factor model of Fama and French (1993), and a_{FFC} is the alpha based on the four-factor model of Fama and French (1993) augmented with the factor of Carhart (1997). For the four-factor model, b is the estimated coefficient of the market risk premium, while s, h, and w are the estimated coefficients of the mimicking portfolios for size (SMB), the undistorted Asness and Frazzini (2013) value (HML), and momentum (WML). We employ the premia construed by Asness and Frazzini (2013). The table reports mean regression coefficients and mean adjusted R^2s, while the percentages below indicate which fraction of SRI indices exhibit a positive (negative) statistically significant coefficient at the five percent level based on the Newey and West (1987) estimator.

The all-embracing value tilt does not change considerably when we sort indices by a combined or positive screening as seen in Table 4. Undistorted value is equally strong in both categories. However, indices applying a combined screening (positive and negative screens) fare much better than indices using exclusively a positive screening. The alphas in all three model specifications attest to that unequivocally.

Table 5. Performance and attribution measurement of SRI indices by weighting approach

	a_{CAPM}	a_{FF}	a_{FFC}	*b*	*s*	*h*	*w*	R^2
Value-weighted	-0.02	0.01	-0.10	0.98	-0.13	0.14	0.02	0.92
	7.35 (13.24)	5.88 (8.82)	5.88 (11.76)	100.00 (0.00)	5.88 (54.41)	50.00 (8.82)	14.71 (8.82)	
Score-weighted	0.82	0.40	0.09	0.98	-0.03	0.16	0.05	0.95
	7.69 (3.85)	3.85 (0.00)	3.85 (0.00)	100.00 (0.00)	11.54 (19.23)	46.15 (3.85)	19.23 (3.85)	
Equal-weighted	-4.26	-4.74	-4.30	0.85	0.01	0.21	-0.05	0.69
	0.00 (33.33)	0.00 (33.33)	0.00 (33.33)	83.33 (0.00)	16.67 (33.33)	16.67 (0.00)	33.33 (0.00)	

Note: This table presents annualized alphas for the regression variants applying three alternative asset pricing models to explain monthly excess returns of SRI indices sorted by weighting approach. Score-weighted portfolios use ESG criteria rankings to attribute weights to the stock constituents of their SRI portfolios. a_{CAPM} denotes the CAPM alpha. a_{FF} is the alpha based on the three-factor model of Fama and French (1993), and a_{FFC} is the alpha based on the four-factor model of Fama and French (1993) augmented with the factor of Carhart (1997). For the four-factor model, b is the estimated coefficient of the market risk premium, while s, h, and w are the estimated coefficients of the mimicking portfolios for size (SMB), the undistorted Asness and Frazzini (2013) value (HML), and momentum (WML). We employ the premia construed by Asness and Frazzini (2013). The table reports mean regression coefficients and mean adjusted R^2s, while the percentages below indicate which fraction of SRI indices exhibit a positive (negative) statistically significant coefficient at the five percent level based on the Newey and West (1987) estimator.

After segmenting the sample by differing weighting approaches, Table 5 reports that the undistorted value strategy is strong across all categories. Score-weighted indices have a stronger alpha than value-weighted or equal-weighted indices for all three model specifications. Equal-weighted SRI indices do not outperform and appear to perform the worst.

Table 6. Performance and attribution measurement of SRI indices by geographical focus (Part 1)

	a_{CAPM}	a_{FF}	a_{FFC}	*b*	*s*	*h*	*w*	R^2
Global	-1.13	-1.07	-1.54	0.89	-0.17	0.20	0.08	0.89
	4.00 (24.00)	4.00 (16.00)	0.00 (24.00)	96.00 (0.00)	0.00 (40.00)	76.00 (0.00)	56.00 (0.00)	
Asia Pacific	-0.85	-2.44	-3.80	0.95	-0.04	0.29	0.11	0.89
	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	100.00 (0.00)	0.00 (0.00)	66.67 (0.00)	33.33 (0.00)	
Europe	-0.32	-0.23	-0.47	1.01	-0.20	0.25	0.03	0.93
	5.88 (11.76)	2.94 (5.88)	5.88 (5.88)	100.00 (0.00)	5.88 (76.47)	58.82 (0.00)	2.94 (2.94)	
North America	0.21	0.51	0.78	0.94	-0.07	0.02	0.00	0.95
	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	100.00 (0.00)	0.00 (33.33)	0.00 (33.33)	0.00 (33.33)	
Australia	0.78	-0.76	-1.94	0.94	0.01	0.30	0.10	0.95
	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	100.00 (0.00)	0.00 (0.00)	100.00 (0.00)	0.00 (0.00)	
Canada	0.85	1.61	1.67	0.95	-0.16	0.00	0.01	0.94
	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	100.00 (0.00)	0.00 (33.33)	33.33 (0.00)	0.00 (0.00)	
Germany	20.92	19.43	17.87	1.25	0.07	0.76	0.12	0.67
	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	100.00 (0.00)	100.00 (0.00)	0.00 (0.00)	100.00 (0.00)	
Spain	-2.15	0.10	1.70	1.04	0.09	-0.12	-0.27	0.95
	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	100.00 (0.00)	0.00 (0.00)	0.00 (100.00)	0.00 (100.00)	
United Kingdom	2.81	2.47	3.05	0.96	0.12	-0.06	-0.03	0.87
	20.00 (0.00)	20.00 (0.00)	20.00 (0.00)	100.00 (0.00)	20.00 (20.00)	20.00 (20.00)	0.00 (20.00)	

Table 6. Performance and attribution measurement of SRI indices by geographical focus (Part 2)

	a_{CAPM}	a_{FF}	a_{FFC}	b	s	h	w	R^2
Israel	-2.34	-1.23	0.24	0.94	0.15	0.00	-0.12	0.82
	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	100.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	
Italy	0.34	1.07	1.24	1.07	0.54	-0.15	-0.03	0.90
	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	100.00 (0.00)	100.00 (0.00)	0.00 (100.00)	0.00 (0.00)	
Japan	-1.11	-1.26	-1.40	0.99	-0.23	0.12	0.03	0.89
	0.00 (25.00)	0.00 (25.00)	0.00 (25.00)	100.00 (0.00)	0.00 (50.00)	25.00 (0.00)	0.00 (0.00)	
Singapore	-4.44	-5.97	-6.65	1.15	-0.09	0.15	0.04	0.93
	0.00 (0.00)	0.00 (100.00)	0.00 (100.00)	100.00 (0.00)	0.00 (0.00)	100.00 (0.00)	0.00 (0.00)	
Switzerland	-4.70	-6.50	-0.57	0.91	0.55	-0.38	-0.65	0.71
	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	100.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	
United States	0.92	0.40	0.58	1.00	0.10	-0.02	-0.02	0.93
	20.00 (6.67)	13.33 (0.00)	13.33 (0.00)	100.00 (0.00)	20.00 (20.00)	0.00 (20.00)	0.00 (20.00)	

Note: This table presents annualized alphas for the regression variants applying three alternative asset pricing models to explain monthly excess returns of SRI indices sorted by geographical focus. The sample ends in May 2012. a_{CAPM} denotes the CAPM alpha. a_{FF} is the alpha based on the three-factor model of Fama and French (1993), and a_{FFC} is the alpha based on the four-factor model of Fama and French (1993) augmented with the factor of Carhart (1997). For the four-factor model, b is the estimated coefficient of the market risk premium, while s, h, and w are the estimated coefficients of the mimicking portfolios for size (SMB), the undistorted Asness and Frazzini (2013) value (HML), and momentum (WML). We employ the premia construed by Asness and Frazzini (2013). The table reports mean regression coefficients and mean adjusted R^2s, while the percentages below indicate which fraction of SRI indices exhibit a positive (negative) statistically significant coefficient at the five percent level based on the Newey and West (1987) estimator.

We also investigate different international markets in Table 6. The pure value strategy is strongly present at the global and regional level with the exception of North America driven by the U.S. market. Finally, we test whether the pure value results are robust when measured in conjunction with additional asset pricing anomalies. We employ two augmented models complementing the base FFC model with the additional anomalies short-term reversal (*STR*), betting-against-beta (*BAB*), and quality-minus-junk (*QMJ*).

$$r_{i,t} - r_{f,t} = a_i + b_i\left(r_{m,t} - r_{f,t}\right) + s_i SMB_t + h_i HML_t + w_i WML_t + t_i STR_t + z_i BAB_t + \varepsilon_{i,t} \quad (4)$$

$$r_{i,t} - r_{f,t} = a_i + b_i\left(r_{m,t} - r_{f,t}\right) + s_i SMB_t + h_i HML_t + w_i WML_t + t_i STR_t + z_i BAB_t + q_i QMJ_t + \varepsilon_{i,t} \quad (5)$$

STR captures the anomaly that stocks with relatively low (high) returns over the past month earn positive (negative) abnormal returns in the following month and is also constructed by Asness and Frazzini (2013). *BAB* is long-leveraged low-beta assets and short high-beta assets, producing significant positive risk-adjusted returns as developed by Frazzini and Pedersen (2014). *QMJ* sorts stocks into those that are safe, profitable, growing, and well-managed (quality) versus stocks that are not (junk) and has been established by Asness et al. (2019). Results of the six-factor model (Eq. (4)) and the seven-factor model (Eq. (5)) incorporating these styles are in Panels A and B of Table 7. Equation (4) can be estimated for the full sample given the availability of the premia, while Eq. (5) can be tested at the global level exclusively without introducing piecemeal results.

Again, all explanatory factors stem from AQR's database.

Table 7. Performance and attribution measurement of SRI indices with an augmented six-factor model and seven-factor model

Panel A: Full sample								
a	***b***	***s***	***h***	***w***	***t***	***z***	***q***	R^2
-0.36	0.97	-0.10	0.17	0.02	-0.04	0.00		0.92
5.00 (9.00)	98.00 (0.00)	8.00 (49.00)	52.00 (3.00)	18.00 (5.00)	4.00 (13.00)	14.00 (20.00)		
Panel B: Global subsample								
a	***b***	***s***	***h***	***w***	***t***	***z***	***q***	R^2
-1.86	0.89	-0.18	0.23	0.08	0.01	0.04	0.02	0.90
0.00 (16.00)	92.00 (0.00)	0.00 (36.00)	80.00 (0.00)	52.00 (0.00)	16.00 (8.00)	12.00 (12.00)	8.00 (0.00)	

Note: This table presents annualized alpha (a) estimates to explain monthly excess returns of SRI indices; b is the estimated coefficient of the market risk premium, while s, h, w, t, z, and q are the estimated coefficients of the mimicking portfolios for size (SMB), the undistorted Asness and Frazzini (2013) value (HML), momentum (WML), short-term reversal (STR), betting-against-beta (BAB), and quality-minus-junk (QMJ). The table reports mean regression coefficients and mean adjusted R^2s, while the percentages below indicate which fraction of SRI indices exhibit a positive (negative) statistically significant coefficient at the five percent level based on the Newey and West (1987) estimator. Panel A employs the Asness and Frazzini (2013) and Frazzini and Pedersen (2014) premia to the full sample, and Panel B the Asness and Frazzini (2013), Frazzini and Pedersen (2014), and Asness et al. (2019) premia to the global subsample.

Panel A of Table 7, looking at all 100 SRI indices, documents that the innovative value measure is even more pronounced in light of additional anomalies with an average *h* coefficient of 0.17 relative to the base case in Panel A of Table A.1 (Appendix) with an average *h* coefficient of 0.15. However, *STR* and *BAB* only play a minor role in explaining the performance of SRI indices, while the adjusted R^2 is slightly higher indicating a better fit. The results are again very similar albeit a bit stronger when looking at the seven-factor model in Panel B of Table 7 compared to the estimated coefficients of the base case at the global level with 25 SRI indices in Table 6.

5. DISCUSSION OF THE RESULTS

As reported, the undistorted value measure shows that sustainable and responsible investments pursue first and foremost a value strategy. This is a new finding.

Prior research on international markets employing the traditional Fama and French (1993) value measure such as research on mutual funds by Renneboog et al. (2008), and on passive indices by Lobe and Walkshäusl (2016) suggests that a growth strategy is prevailing for SRI. Of the 17 countries Renneboog et al. (2008) consider in their sample, 11 have a negative *h* loading. Lobe and Walkshäusl (2016) report that out of 31 SRI indices, 25 are tilted towards growth (12 statistically significant at the five percent level), while only six exhibit a value tilt (one significant).

Beta results stay in line with Renneboog et al. (2008) who report 10 (7) negative (positive) loadings, while Lobe and Walkshäusl (2016) show that the averaged beta over 31 SRI indices is 0.98 in the four-factor model.

The broad evidence clearly says that SRI portfolios have in general a big-cap tilt. Results on size again agree with Renneboog et al. (2008) reporting 11 out of 17 countries with a negative *s* loading and with Lobe and Walkshäusl (2016) documenting 20 negative (seven significant) and 11 positive (four significant) loadings on size.

Renneboog et al. (2008) record 12 out of 17 countries in their mutual fund sample with negative momentum, while Lobe and Walkshäusl (2016) show that 23 SRI indices offer a negative momentum tilt (seven significant), while eight have a positive momentum tilt, but are insignificant. The discrepancy in the momentum results between this study which reports more statistically significant positive than negative momentum coefficients, and the cited studies can be explained by the interaction effect between value and momentum. Due to the latter two studies' use of the traditional *HML* measure, momentum contaminates the traditional value coefficient while reducing the power of the momentum estimates at the same time.

Our paper does not address the social welfare of SRI, but it is worth noting that positive screening does not do so well from an investor's financial point of view. According to Oehmke and Opp's (2023) theory of socially responsible investment, investments in sin industries are not necessarily inconsistent with SRI which is admissible under positive screens in general. That screening is also closer related to the more welfare-generating voice option as laid out by Broccardo et al. (2022) than combined screening which also includes the exit option. It might be that the social costs attached to that screening are not internalized in the ESG investor's financial return. Whatever the explanation, this is an important finding for ESG investors.

That score-weighted indices have the strongest alpha confirms Edmans (2011). With DeMiguel et al.'s (2009) results in mind that equal-weighted portfolios perform well, one could presume a priori that their results might translate to an ESG constrained portfolio setting. However, SRI firms tend to be bigger (most small firms are not covered by ESG providers), and hence the power of equal weighting cannot come to fruition for SRI indices in general. It is reassuring that equal-weighted SRI indices have a small size tilt exhibiting a positive *s* while the other weighting schemes have negative *s* loadings.

We cannot detect a pure value strategy in U.S. SRI portfolios. However, the U.S. market is probably the toughest market to capture a value strategy because the value premium is buried in small-cap firms among other obstacles as pointed out by Houge and Loughran (2006). In line with the argument made by Fama and French (2012), noise at the country level could be the reason why SRI indices covering markets in Spain, the United Kingdom, Italy, and Switzerland cannot confirm the value orientation in comparison to more diversified regional and global portfolios.

6. CONCLUSION

Future research could conduct an out-of-sample test by adding more sample years. This would also allow then for more reliable sample splits, to investigate bull and bear markets, for example. Broadening the sample horizon not only introduces the element of a longer time period but also changes the sample's constituents. New SRI indices enter and inactive indices leave the sample composition. It might be that adding an out-of-sample period mirrors the results of our paper's sample period, but it also might hold new insights due to a new time series and a new sample composition. This promising avenue is left for future research.

Our study has limitations. It could be conjectured that the switch from growth to value which is documented in our paper when applying the pure value measure is more systematic in nature and not just happening to SRI portfolios alone. This is a possibility as we do not know how sensitive our existing knowledge of value characteristics would be to a pure value switch when analyzing other investment themes or investment products like mutual funds. For example, could we see a similar value effect for Islamic investing as for SRI? Based on the traditional value measure, growth is a predominant characteristic of Islamic portfolios as documented in Walkshäusl and Lobe (2012). Future research could unveil whether other investment themes or investment products experience a similar value revelation as SRI portfolios do as reported in our paper.

Collecting a comprehensive set of 100 international SRI indices from mainly developed markets we find that SRI pursues first and foremost a "pure" value strategy based on the Asness and Frazzini (2013) value metric free from momentum effects. This result shows up irrespective of the choice of the index provider, the screening, and the weighting approach applied to an SRI index. SRI's pure value strategy is present in most international markets. This finding is robust across five asset pricing model specifications controlling for systematic risk, size, momentum, short-term reversal, betting-against-beta, and quality-minus-junk. By and large, the financial performance is neutral with slight indications that score-weighted indices and a combined screening approach (positive and negative screens) are financially more beneficial.

Practical implications for investors are that passive sustainable and responsible investments deliver not only the ESG promise but also a financial exposure to a pure value strategy. We finally hope that academics get encouraged by our work to use the pure value measure in future research to obtain an undistorted SRI characteristics classification. SRI is not growth, but value.

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APPENDIX

Table A.1. Performance and attribution measurement of SRI indices with alternative asset pricing models (Part 1)

Panel A: Aggregate results							
a_{CAPM}	a_{FF}	a_{FFC}	*b*	*s*	*h*	*w*	R^2
-0.06	-0.17	-0.30	0.97	-0.09	0.15	0.02	0.91
7.00 (12.00)	5.00 (8.00)	5.00 (10.00)	99.00 (0.00)	8.00 (44.00)	47.00 (7.00)	17.00 (7.00)	

Panel B: Results at index level									
Index name	*Data from to*	a_{CAPM}	a_{FF}	a_{FFC}	*b*	*s*	*h*	*w*	R^2
ASPI Eurozone	02:1992	0.99	0.82	0.54	1.10	-0.32	0.14	0.02	0.91
		0.73	*0.64*	*0.36*	*33.65*	*-6.04*	*1.89*	*0.50*	
Calvert Social (CSI)	05:2000	-1.72	-1.58	-0.95	0.99	-0.01	-0.08	-0.10	0.95
		-1.83	*-1.64*	*-1.09*	*35.22*	*-0.14*	*-4.26*	*-5.45*	
Credit Suisse Social Awareness Index	04:2003	-33.74	-34.16	-34.27	0.04	0.09	0.18	0.02	-0.01
		-7.98	*-6.25*	*-7.12*	*0.33*	*0.49*	*0.65*	*0.10*	
DaxGlobal Sarasin Germany	11:2007	20.92	19.43	17.87	1.25	0.07	0.76	0.12	0.67
		1.57	*1.34*	*1.48*	*12.45*	*0.40*	*1.92*	*0.62*	
DaxGlobal Sarasin Switzerland	11:2007	-4.70	-6.50	-0.57	0.91	0.55	-0.38	-0.65	0.71
		-0.49	*-0.73*	*-0.11*	*11.02*	*2.91*	*-1.33*	*-2.54*	
DJSI Asia Pacific	01:2004	-1.29	-2.70	-4.66	1.04	-0.05	0.30	0.12	0.94
		-0.80	*-1.29*	*-1.90*	*27.73*	*-0.58*	*2.83*	*2.07*	
DJSI Europe	10:2001	-1.45	-1.06	-0.87	0.95	-0.19	0.26	-0.02	0.96
		-0.95	*-0.84*	*-0.69*	*34.51*	*-3.16*	*2.16*	*-0.32*	
DJSI Europe 40	02:1994	-1.87	-1.58	-1.77	0.98	-0.19	0.16	0.01	0.95
		-2.08	*-1.64*	*-1.87*	*39.27*	*-4.09*	*1.87*	*0.35*	
DJSI Europe ex ATGAF	10:2001	1.13	0.71	-0.60	0.94	-0.30	0.21	0.07	0.92
		0.90	*0.70*	*-0.47*	*33.37*	*-7.18*	*4.08*	*2.50*	
DJSI Europe ex ATGAFAE	10:2001	-1.52	-0.70	-0.46	1.00	-0.30	0.07	-0.02	0.95
		-1.19	*-0.63*	*-0.39*	*29.13*	*-5.55*	*0.76*	*-0.32*	
DJSI Eurozone	10:2001	-1.86	-1.54	-2.78	1.07	-0.37	0.53	0.13	0.93
		-0.89	*-0.94*	*-1.85*	*29.17*	*-4.28*	*3.28*	*1.39*	
DJSI Eurozone 40	10:2001	-1.00	-0.71	-2.15	1.04	-0.36	0.53	0.15	0.92
		-0.45	*-0.39*	*-1.17*	*22.87*	*-3.89*	*2.99*	*1.49*	
DJSI Eurozone ex ATGAF	10:2001	-2.10	-1.66	-2.86	1.06	-0.36	0.59	0.13	0.94
		-1.03	*-1.01*	*-1.81*	*30.98*	*-4.06*	*3.93*	*1.39*	
DJSI Eurozone ex ATGAFAE	10:2001	-2.16	-1.70	-2.93	1.07	-0.36	0.60	0.13	0.94
		-1.04	*-1.02*	*-1.80*	*30.60*	*-3.94*	*3.95*	*1.40*	
DJSI North America	01:1999	-0.97	-0.01	0.56	0.96	-0.16	-0.08	-0.08	0.93
		-0.98	*-0.01*	*0.54*	*33.97*	*-3.92*	*-2.43*	*-2.90*	
DJSI United States	01:1999	-1.16	-0.17	0.36	0.95	-0.16	-0.08	-0.08	0.92
		-1.12	*-0.19*	*0.35*	*30.93*	*-3.87*	*-2.32*	*-2.56*	
DJSI World	09:1999	-1.59	-0.84	-0.99	1.03	-0.25	0.07	0.01	0.97
		-1.99	*-1.11*	*-1.42*	*51.31*	*-10.00*	*3.52*	*0.94*	
DJSI World Enlarged	10:2005	-1.35	-1.39	-1.83	0.97	-0.16	0.17	0.08	0.99
		-1.57	*-1.75*	*-2.31*	*55.44*	*-3.91*	*3.39*	*2.90*	
DJSI World Enlarged ex ATGAFAE	10:2005	-1.51	-1.56	-1.95	0.98	-0.14	0.16	0.07	0.99
		-2.17	*-2.39*	*-2.72*	*52.71*	*-3.53*	*3.18*	*2.52*	
DJSI World ex ATGAF	09:1999	-1.79	-0.98	-1.11	1.03	-0.26	0.07	0.01	0.97
		-1.95	*-1.20*	*-1.36*	*48.78*	*-9.43*	*3.02*	*0.67*	
DJSI World ex US	09:1999	-0.10	0.59	-0.54	1.10	-0.21	0.11	0.09	0.96
		-0.09	*0.68*	*-0.63*	*40.74*	*-5.12*	*2.85*	*3.45*	
ECPI Ethical EMU Equity	02:2003	-3.02	-2.45	-3.94	1.08	-0.26	0.48	0.14	0.94
		-1.92	*-2.03*	*-3.62*	*30.80*	*-3.38*	*3.78*	*2.17*	
ECPI Ethical Euro Equity	11:2000	-2.42	-2.24	-1.56	1.02	-0.25	0.07	-0.04	0.96
		-2.37	*-2.52*	*-1.41*	*41.78*	*-6.22*	*1.05*	*-1.03*	
ECPI Ethical Europe Tradable Equity	02:2003	-1.05	-0.58	-0.48	0.90	-0.22	0.12	-0.01	0.91
		-0.42	*-0.21*	*-0.13*	*13.48*	*-3.81*	*0.52*	*-0.06*	
ECPI Ethical Index Global Equity	02:2001	-1.61	-1.34	-1.63	0.96	-0.21	0.12	0.02	0.96
		-2.14	*-1.82*	*-2.03*	*48.14*	*-6.38*	*3.75*	*1.45*	
ECPI Global Alpha 40	02:2003	-3.56	-3.36	-4.22	0.88	-0.17	0.22	0.10	0.92
		-2.82	*-2.73*	*-2.90*	*29.15*	*-1.84*	*3.08*	*1.81*	
ECPI Global ESG Alpha Equity	02:2003	-1.17	-0.85	-1.73	0.97	-0.21	0.21	0.10	0.94
		-0.93	*-0.76*	*-1.54*	*24.73*	*-2.31*	*1.98*	*2.12*	
ECPI Global Top 25 Ethical	02:2003	-5.82	-5.79	-6.61	1.01	-0.25	0.38	0.10	0.89
		-3.40	*-3.30*	*-4.27*	*18.85*	*-1.74*	*2.61*	*1.33*	
ECPI Italy SME's Equity	02:2003	0.34	1.07	1.24	1.07	0.54	-0.15	-0.03	0.90
		0.10	*0.42*	*0.47*	*25.94*	*5.11*	*-2.04*	*-0.35*	
ESI Excellence Europe Euro	02:2003	-0.66	-0.29	-0.56	0.98	-0.17	0.18	0.03	0.95
		-0.56	*-0.27*	*-0.51*	*38.07*	*-2.86*	*1.74*	*0.55*	
ESI Excellence Europe Hedged Euro	12:2004	-0.49	-0.14	-0.04	1.04	-0.27	0.14	-0.01	0.94
		-0.27	*-0.10*	*-0.03*	*28.20*	*-3.69*	*1.02*	*-0.14*	
ESI Excellence Europe W/O Multipliers	02:2003	0.03	0.46	-0.66	0.48	-0.19	0.52	0.11	0.67
		0.01	*0.15*	*-0.21*	*9.37*	*-1.51*	*2.68*	*0.97*	
ESI Excellence Global	02:2003	-1.42	-1.03	-1.63	0.91	-0.26	0.20	0.07	0.94
		-1.24	*-1.04*	*-1.32*	*35.84*	*-3.83*	*2.12*	*1.24*	

Table A.1. Performance and attribution measurement of SRI indices with alternative asset pricing models (Part 2)

Index name	*Data from to*	a_{CAPM}	a_{FF}	a_{FFC}	*b*	*s*	*h*	*w*	R^2
EURO STOXX Sustainability	02:1999	-2.11	-1.63	-1.54	1.14	-0.33	0.13	-0.01	0.93
		-1.23	*-0.93*	*-0.79*	*32.55*	*-5.56*	*1.75*	*-0.14*	
EURO STOXX Sustainability 40 Index	11:2001	-1.95	-1.32	-1.57	1.05	-0.40	0.35	0.02	0.93
		-0.97	*-0.81*	*-0.89*	*27.90*	*-5.34*	*3.01*	*0.24*	
EURO STOXX Sustainability ex ATGAF	10:2001	-2.49	-2.20	-2.01	1.15	-0.31	0.15	-0.01	0.93
		-1.48	*-1.27*	*-1.01*	*35.77*	*-4.42*	*1.85*	*-0.33*	
EURO STOXX Sustainability ex ATGAFAE	02:1999	-3.31	-2.75	-3.00	1.11	-0.36	0.31	0.02	0.94
		-1.76	*-1.81*	*-1.88*	*28.81*	*-5.22*	*3.05*	*0.34*	
Fondaco/Avanzi EU SRI	07:2009–06:2011	-1.32	0.93	1.45	0.98	-0.19	0.17	-0.05	0.97
		-0.87	*0.51*	*0.78*	*20.41*	*-3.54*	*0.91*	*-0.48*	
FTSE4Good Europe	08:1996	-0.77	-1.01	-1.48	0.98	-0.20	0.15	0.03	0.96
		-0.85	*-1.22*	*-1.70*	*52.21*	*-4.91*	*3.73*	*1.14*	
FTSE4Good Europe 50	08:1996	-2.36	-1.77	-2.43	0.96	-0.35	0.11	0.04	0.96
		-2.03	*-1.68*	*-2.22*	*46.38*	*-9.94*	*3.49*	*1.64*	
FTSE4Good Global	08:1996	0.71	0.96	1.05	1.01	-0.29	0.05	-0.01	0.95
		0.60	*0.93*	*0.94*	*51.33*	*-7.30*	*1.50*	*-0.25*	
FTSE4Good Global 100	08:1996	0.24	0.99	0.75	1.00	-0.47	0.03	0.02	0.93
		0.15	*0.73*	*0.53*	*34.04*	*-7.80*	*0.64*	*0.46*	
FTSE4Good IBEX	05:2008	-2.15	0.10	1.70	1.04	0.09	-0.12	-0.27	0.95
		-0.83	*0.04*	*1.05*	*47.11*	*1.20*	*-2.17*	*-4.00*	
FTSE4Good Japan	01:2005	-0.47	-0.98	-1.00	0.97	-0.25	0.10	0.00	0.87
		-0.31	*-0.87*	*-0.83*	*22.07*	*-4.25*	*1.93*	*0.06*	
FTSE4Good UK	08:1996	0.14	0.02	-0.59	0.93	-0.04	0.07	0.04	0.92
		0.17	*0.02*	*-0.57*	*52.07*	*-1.20*	*1.76*	*1.06*	
FTSE4Good UK 50	08:1996	1.28	1.16	0.39	0.94	-0.14	0.10	0.04	0.91
		1.08	*1.02*	*0.35*	*51.87*	*-3.92*	*2.41*	*1.23*	
FTSE4Good United States	08:1996	-0.41	-0.07	0.33	1.00	-0.16	-0.02	-0.04	0.91
		-0.33	*-0.07*	*0.28*	*28.15*	*-4.52*	*-0.51*	*-1.25*	
FTSE4Good United States 100	08:1996	-0.29	0.16	0.42	0.99	-0.21	0.00	-0.03	0.89
		-0.20	*0.12*	*0.30*	*26.60*	*-4.78*	*-0.07*	*-0.68*	
Global Challenges Index (GCX)	09:2007	0.09	0.55	1.70	0.72	-0.45	-0.36	-0.26	0.31
		0.01	*0.08*	*0.23*	*4.44*	*-1.32*	*-0.85*	*-1.00*	
Jantzi Social	06:2001	-2.21	-1.86	-1.56	0.96	-0.21	0.09	-0.02	0.94
		-1.87	*-1.76*	*-1.33*	*49.05*	*-3.93*	*2.13*	*-0.80*	
Kempen / SNS Smaller Europe ex UK SRI	02:1999	7.04	3.20	4.52	1.11	0.73	0.08	-0.08	0.87
		2.17	*1.18*	*1.36*	*26.77*	*6.10*	*0.60*	*-1.03*	
Kempen / SNS Smaller Europe SRI	02:1999	5.78	2.99	5.77	1.08	0.71	-0.16	-0.16	0.87
		1.84	*1.22*	*2.10*	*24.18*	*7.81*	*-1.13*	*-2.32*	
Kempen / SNS Smaller UK SRI	02:1999	3.63	2.31	6.20	1.09	0.61	-0.44	-0.22	0.73
		0.76	*0.59*	*1.58*	*15.75*	*6.02*	*-3.21*	*-2.71*	
Morningstar SRI Index	06:2003	-2.63	-2.62	-2.85	1.02	-0.26	0.11	0.02	0.95
		-2.10	*-2.53*	*-2.92*	*47.18*	*-5.72*	*2.64*	*0.60*	
MSCI Australia ESG	10:2007	1.48	-0.21	-1.46	0.94	0.03	0.31	0.11	0.95
		0.44	*-0.08*	*-0.69*	*23.65*	*0.34*	*3.72*	*1.32*	
MSCI Australia SRI	10:2007	0.08	-1.32	-2.42	0.94	-0.02	0.28	0.10	0.96
		0.03	*-0.55*	*-1.10*	*27.69*	*-0.21*	*3.63*	*1.28*	
MSCI Canada ESG	10:2007	1.40	2.16	2.21	0.97	-0.14	-0.04	-0.01	0.96
		0.64	*1.03*	*1.08*	*34.51*	*-1.69*	*-0.45*	*-0.37*	
MSCI Canada SRI	10:2007	3.34	4.54	4.36	0.92	-0.13	-0.04	0.05	0.91
		1.13	*1.49*	*1.46*	*29.88*	*-1.04*	*-0.60*	*1.14*	
MSCI EMU ESG	10:2007	1.18	0.84	0.29	1.08	-0.25	0.48	0.07	0.95
		0.43	*0.37*	*0.12*	*26.67*	*-2.05*	*2.85*	*0.70*	
MSCI EMU SRI	10:2007	0.28	-0.07	-0.81	1.05	-0.23	0.55	0.10	0.94
		0.09	*-0.03*	*-0.29*	*26.82*	*-1.64*	*3.54*	*1.15*	
MSCI Europe ESG	10:2007	1.87	1.71	1.32	0.94	-0.06	0.26	0.05	0.96
		0.91	*0.73*	*0.60*	*42.71*	*-0.73*	*2.78*	*0.89*	
MSCI Europe ex UK ESG	10:2007	3.38	3.17	2.74	1.03	-0.15	0.32	0.06	0.96
		1.56	*1.67*	*1.41*	*29.86*	*-1.58*	*2.28*	*0.66*	
MSCI Europe ex UK SRI	10:2007	2.93	2.71	2.25	1.00	-0.17	0.33	0.06	0.96
		1.19	*1.36*	*1.23*	*34.43*	*-1.66*	*4.09*	*1.10*	
MSCI Europe SRI	10:2007	4.12	3.95	3.82	0.96	-0.08	0.21	0.02	0.96
		2.31	*2.07*	*2.17*	*42.59*	*-0.79*	*2.81*	*0.28*	
MSCI Japan ESG	10:2007	-1.02	-0.92	-1.07	0.99	-0.18	0.10	0.04	0.88
		-0.51	*-0.44*	*-0.50*	*18.75*	*-1.64*	*1.37*	*0.74*	
MSCI Japan SRI	10:2007	-0.31	-0.52	-0.69	0.99	-0.22	0.15	0.05	0.86
		-0.11	*-0.21*	*-0.28*	*18.80*	*-1.82*	*1.72*	*0.70*	
MSCI KLD 400 Social	05:1990	1.26	1.03	1.64	0.84	0.00	0.04	-0.05	0.75
		1.09	*1.02*	*1.33*	*17.71*	*-0.06*	*0.80*	*-1.87*	
MSCI North America ESG	10:2007	0.18	0.21	0.27	0.97	-0.02	0.03	0.02	0.97
		0.17	*0.18*	*0.24*	*36.62*	*-0.29*	*0.53*	*0.56*	
MSCI North America SRI	10:2007	1.42	1.34	1.52	0.88	-0.02	0.12	0.05	0.95
		0.75	*0.82*	*1.05*	*28.31*	*-0.28*	*1.32*	*1.02*	
MSCI Pacific ESG	10:2007	-0.59	-2.37	-3.56	0.91	-0.05	0.32	0.12	0.87
		-0.21	*-1.01*	*-1.46*	*21.03*	*-0.35*	*2.70*	*1.36*	

Table A.1. Performance and attribution measurement of SRI indices with alternative asset pricing models (Part 3)

Index name	*Data from to*	a_{CAPM}	a_{FF}	a_{FFC}	*b*	*s*	*h*	*w*	R^2
MSCI Pacific SRI	10:2007	-0.68	-2.26	-3.18	0.91	-0.03	0.26	0.09	0.87
		-0.26	*-0.99*	*-1.40*	*18.95*	*-0.25*	*1.89*	*0.91*	
MSCI UK ESG	10:2007	2.36	2.12	2.41	0.87	0.02	0.05	-0.03	0.89
		0.86	*0.80*	*0.76*	*24.46*	*0.24*	*0.42*	*-0.29*	
MSCI UK SRI	10:2007	6.63	6.73	6.82	0.98	0.12	-0.07	-0.01	0.91
		2.73	*2.73*	*3.04*	*22.52*	*1.11*	*-0.55*	*-0.11*	
MSCI USA Broad ESG	01:2001	-0.78	-0.90	-0.99	1.03	0.04	-0.01	0.02	0.95
		-1.03	*-1.37*	*-1.48*	*42.47*	*1.26*	*-0.38*	*0.81*	
MSCI USA ESG	01:2001	-1.18	-0.89	-0.92	1.02	-0.04	-0.01	0.01	0.95
		-1.50	*-1.19*	*-1.26*	*42.23*	*-0.95*	*-0.52*	*0.33*	
MSCI USA ESG Select	01:2001	1.03	0.86	0.99	1.02	-0.05	-0.06	-0.04	0.95
		0.58	*0.52*	*0.59*	*36.22*	*-0.75*	*-0.73*	*-0.56*	
MSCI USA Investable Market ESG	01:2001	-0.79	-0.91	-1.00	1.03	0.04	-0.01	0.02	0.95
		-1.04	*-1.38*	*-1.49*	*42.43*	*1.28*	*-0.39*	*0.81*	
MSCI USA Large Cap ESG	01:2001	-2.03	-1.40	-0.91	0.99	-0.06	-0.11	-0.10	0.95
		-2.02	*-1.49*	*-0.94*	*39.49*	*-1.32*	*-2.99*	*-3.42*	
MSCI USA Mid Cap ESG	01:2001	3.96	1.97	1.94	1.05	0.39	-0.03	0.01	0.94
		2.73	*2.67*	*2.43*	*37.08*	*7.91*	*-0.97*	*0.27*	
MSCI USA Small and Mid Cap ESG	01:2001	3.61	0.72	0.67	1.05	0.57	-0.04	0.01	0.95
		2.40	*0.95*	*0.95*	*41.79*	*14.65*	*-1.60*	*0.45*	
MSCI USA Small Cap ESG	01:2001	2.84	-1.14	-1.19	1.06	0.82	-0.03	0.01	0.95
		1.50	*-1.23*	*-1.41*	*36.23*	*18.80*	*-1.01*	*0.31*	
MSCI USA SRI	10:2007	1.32	1.13	1.23	0.88	0.04	0.09	0.02	0.93
		0.58	*0.55*	*0.62*	*18.59*	*0.45*	*0.86*	*0.39*	
MSCI USA SRI Mid Cap	10:2007	8.09	7.22	7.17	1.10	0.27	0.03	-0.01	0.93
		3.42	*3.43*	*3.24*	*20.08*	*1.53*	*0.20*	*-0.15*	
MSCI World ESG	10:2007	1.27	1.02	0.35	0.92	-0.12	0.33	0.15	0.98
		0.78	*0.65*	*0.23*	*43.91*	*-1.36*	*6.08*	*4.34*	
MSCI World ex Australia ESG	10:2007	1.77	1.54	0.93	0.90	-0.12	0.30	0.13	0.97
		1.38	*0.97*	*0.61*	*36.45*	*-1.25*	*4.22*	*3.12*	
MSCI World ex Australia SRI	10:2007	2.15	1.85	1.21	0.88	-0.16	0.36	0.14	0.97
		1.34	*1.31*	*0.98*	*87.58*	*-1.60*	*6.87*	*3.70*	
MSCI World ex EMU ESG	10:2007	2.77	2.51	1.84	0.85	-0.04	0.28	0.14	0.96
		1.81	*1.29*	*0.98*	*35.30*	*-0.38*	*4.49*	*4.15*	
MSCI World ex EMU SRI	10:2007	3.49	3.17	2.47	0.83	-0.06	0.32	0.15	0.96
		2.27	*3.29*	*1.79*	*82.88*	*-0.65*	*4.95*	*3.88*	
MSCI World ex Europe ESG	10:2007	3.01	2.72	1.82	0.82	-0.02	0.34	0.19	0.95
		1.70	*1.38*	*0.90*	*32.60*	*-0.19*	*5.03*	*4.33*	
MSCI World ex Europe SRI	10:2007	3.30	2.87	1.94	0.79	-0.05	0.41	0.20	0.95
		1.51	*1.90*	*1.21*	*47.07*	*-0.67*	*4.29*	*3.31*	
MSCI World ex UK ESG	10:2007	1.76	1.54	1.00	0.92	-0.09	0.30	0.14	0.97
		1.26	*0.95*	*0.71*	*41.95*	*-0.94*	*4.40*	*3.20*	
MSCI World ex UK SRI	10:2007	1.81	1.48	0.89	0.89	-0.13	0.37	0.15	0.97
		0.97	*0.99*	*0.68*	*58.25*	*-1.33*	*4.65*	*2.81*	
MSCI World ex USA SRI	10:2007	0.77	0.64	0.75	1.02	-0.11	0.07	-0.02	0.96
		0.47	*0.71*	*0.60*	*44.97*	*-0.78*	*0.99*	*-0.51*	
MSCI World SRI	10:2007	2.30	1.99	1.37	0.89	-0.13	0.33	0.13	0.97
		1.48	*1.44*	*1.20*	*80.12*	*-1.32*	*8.01*	*4.32*	
Singapore SRI	11:1996–12:2007	-4.44	-5.97	-6.65	1.15	-0.09	0.15	0.04	0.93
		-1.82	*-2.47*	*-2.51*	*32.70*	*-1.16*	*4.06*	*0.84*	
STOXX Europe Sustainability	02:1999	-0.83	-0.73	-0.99	0.96	-0.22	0.15	0.02	0.95
		-0.99	*-0.76*	*-1.00*	*61.58*	*-5.38*	*3.84*	*0.70*	
STOXX Europe Sustainability 40 Index	11:2001	-1.41	-0.33	0.16	0.98	-0.38	0.04	-0.03	0.95
		-0.98	*-0.29*	*0.14*	*32.43*	*-5.98*	*0.52*	*-0.60*	
STOXX Europe Sustainability Euro ex ATGAF	10:2001	-2.09	-1.78	-1.90	0.97	-0.19	0.15	0.01	0.95
		-2.20	*-1.66*	*-1.75*	*36.59*	*-4.10*	*1.35*	*0.21*	
STOXX Europe Sustainability Euro ex ATGAFAE	02:1999	-1.23	-1.23	-1.32	0.97	-0.22	0.16	0.01	0.95
		-1.42	*-1.28*	*-1.27*	*55.50*	*-6.04*	*4.08*	*0.22*	
Tel Aviv Stock Exchange Maala SRI	03:2005	-2.34	-1.23	0.24	0.94	0.15	0.00	-0.12	0.82
		-0.81	*-0.32*	*0.06*	*16.31*	*1.65*	*0.04*	*-1.05*	

Note: This table presents the name of the SRI index, the start month followed by the month when the index ceases to exist, and annualized alphas for the regression variants applying three alternative asset pricing models to explain monthly excess returns of SRI indices. a_{CAPM} denotes the CAPM alpha. a_{FF} is the alpha based on the three-factor model of Fama and French (1993), and a_{FFC} is the alpha based on the four-factor model of Fama and French (1993) augmented with the factor of Carhart (1997). For the four-factor model, b is the estimated coefficient of the market risk premium, while s, h, and w are the estimated coefficients of the mimicking portfolios for size (SMB), the undistorted Asness and Frazzini (2013) value (HML), and momentum (WML). We employ the premia construed by Asness and Frazzini (2013). Panel A displays mean regression coefficients and mean adjusted R^2s, while the percentages below indicate which fraction of SRI indices exhibit a positive (negative) statistically significant coefficient at the five percent level. In Panel B, robust Newey and West (1987) t-statistics are in italics.